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U.S.S. WASHINGTON

INTRODUCTION TO THE HELICOPTER

HOOKING AN AIRPLANE TO AN AIRSHIP

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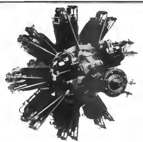

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Aircraft Industry not Decrepit

IN a recent statement Representative Lampert, Chairman of the Special Aircraft Investigating Committee, gave the impression that the American aircraft industry is now in a very bad condition both financially and as to orders. That this impression is general is also true. The public believes that the factories making airplanes are idle and waiting orders that the government is withholding. It does not realize that the situation existing last year has changed. The real condition is that at present practically all the manufacturers of aerial equipment are well supplied with government business. There are exceptions of course as there will always be, due to the lack of a continuing policy of procurement, but with the exception of two or three factories all appear to have practically all the business that they can handle for a number of months. The disappearance of several large aircraft factories from the field has narrowed down the sources of supply to a comparatively few capable builders of air equipment. It will be unfortunate if the impression of the condition that obtained last year in the aeronautical industry is allowed to continue, and there will be a reaction from the public if it persists.

It is only natural that the companies that make up the industry will not cry from the house tops their prosperous condition, for they know that as soon as their present orders are completed, they will possibly be in the same condition that they were during last year. It is reassuring, however, to know that there has never been available since the War, the amount of appropriations that are now ready to be spent by the services. The recent agitation has so aroused public sentiment that there will undoubtedly be a greater tendency to give production orders for air equipment than ever before. In an early issue we hope that figures will appear that will show the volume of business that each company has received during the last five years and also the amount of orders on hand. In this way it may be known just what the true condition of the aircraft industry in this country is at the present time.

Lifting the Navy into the Air

LORD THOMSON, Air Minister of Great Britain under the Labor Government, sailed for England this month after a visit of a few weeks during which he gave several addresses on air power.

As a parting shot, he made the following comment on naval conservation: "During a discussion in the House of Lords, an Admiral said: 'Our ships must be submerged into the sea or lifted into the air.' In replying, I remarked: 'It will not be nearly as difficult to invent a form of aviation to lift the navy out of the sea as it will be to lift the admiralty from its hoary old ruts.'"

Lieut. G. R. Fairlamb, of the Naval Air Service, who is stationed at the strategic station of Coco Solo in the Canal Zone also indicates in an article on "The Independent Air Force" how necessary it is for the commanding officers of fleets and naval stations to get the point of view of the airmen.

"Due to a variety of causes," he writes, "perhaps all of them springing from the lack of clear vision on the part of senior officers of both services, the agitation for an independent air force is being felt with a greater strength than ever before.

"A classmate of the writer's who went to a certain catapult ship as an aviation officer, was made to appear as the ship's 'politician,' treated accordingly, denied opportunity to fly his ships, and hampered in his work. He disgustedly stated that naval aviation was hopeless until the older crowd passed on. This was not an isolated phenomenon. It is an illustrative case in point and many others could be cited.

"The majority sentiment among naval pilots has been in the past opposed to the idea, most probably because they are sailormen first and aviators incidentally, and because most of them have had sufficient background of naval life, strategy and tactics, to believe that aviation to be useful to the Navy must be part and parcel of the Navy, *but the sentiment of Naval pilots is apparently changing in favor of the new scheme.*"

The attitude of both the English and American high Naval commands seem to be very similar. It is refreshing to hear a Naval officer speak out with boldness and admit that Naval air pilots are disgusted with the present air policy. It will help "Lift the Navy into the Air" which, by the way, may become a popular slogan in the years to come.

$9,000,000 More for British Air Force

IN presenting the British Air Budget for 1925-26, Sir Samuel Hoare, Secretary of State for Air told the House of Commons that the "grant-in-aid" from the Admiralty of £1,972,000 for the expenses of the Fleet Air Arm was really an increase in the appropriations for the Royal Air Force. He said that it did not in any way deprive the Air Ministry of its undivided responsibility for all air development.

He stated that there had never been such unanimity among the leaders of all parties upon any question of defense. That the Government was carrying through a program of trebling the combatant strength of the Air Force. He found that the new types of aircraft as compared to those built during the War cost about twice as much.

How different this sounds from the reports current in this country about the dissensions in Great Britain over air power. It also means that the British are to spend next year over $100,000,000 on air development. But more important than all it indicates that an independent air force that has an equal voice with the older arms is able to get its proper support and does not have to live on a small part of the appropriations of the Army and Navy. It is no longer a parasite service.

An Introduction to the Helicopter*

By ALEXANDER KLEMIN

Associate Professor of Aeronautics, New York University

The helicopter or direct-lift type of aircraft has many enthusiastic supporters, and the achievement of vertical ascent, vertical descent and hovering flight are beyond doubt of real interest. In spite of numerous flights already made with this type of aircraft, it is difficult to say at the moment whether we have, in the present-day helicopter, the first stages of a valuable type of flying machine, or merely a forced idea. There is however a possibility of ultimate success, and investigation should undoubtedly be continued till a definite solution is reached.

To achieve utility, the helicopter must climb vertically with a moderate degree of useful load, attain a reasonable ceiling, achieve vertical descent with motors in action, achieve safe descent—if not vertically, then at least on a steep path with dead motor, have a reasonable speed in horizontal flight, be fairly stable and completely controllable, and have reasonable assurance of correct functioning of its mechanism. In these requirements we have the outline of the whole subject.

Lifting Airscrews

The obtaining of a large thrust/power ratio with a lifting, stationary airscrew is not the solution of the helicopter, and is in fact one of the requirements most readily achieved. The work delivered to the airscrew is equal to the kinetic energy of the air after it has passed the airscrew—if aerodynamic losses are neglected—and is therefore proportional to the square of the slipstream velocity, multiplied by the mass of air approaching the airscrew in a given unit of time. The thrust, on the other hand, is proportional to the slipstream velocity multiplied by the same mass. To achieve a large thrust/power ratio it follows that the slipstream velocity must be low for a given thrust, in other words, a large mass of air should receive a small acceleration in passing through the airscrew. This is achievable by having a large diameter or disk area, and theoretically there is no limit to the value of the thrust/power ratio achievable by the simple expedient of increasing the diameter. In practice, of course, the weight of the airscrews would go up so rapidly with increased diameter that a point would be reached where all further advantage in increasing the diameter would disappear.

Most remarkable success has already been achieved in obtaining lifts which closely approach to theoretical values, at least one wind-tunnel test shows a value of 74 per cent of the theoretical.

Climb

The regime of the helicopter airscrew in vertical climb coincides with that of an airplane propeller working at a very small value of V/nD, or a low value of forward velocity. It is clear therefore that a low pitch airscrew is always likely to give the best results, but a variable pitch airscrew would probably be very useful in helicopter vertical climb. Even with a fixed blade airscrew, calculations show that provided the maximum horsepower is not designed to give mere sustentation, there should be no difficulty in securing adequate climb. Thus a 2000 lb. helicopter with a four bladed propeller of 38.4 ft. diameter might be sustained with 100 hp., and achieve a climb of 600 ft./min. with 123 hp., with a somewhat higher torque than that required for sustentation. This means that the engine would have to deliver the 100 hp. required for sustentation, throttled down to some extent, if no variable speed reduction were provided. With an engine of 140 hp. maximum it would be easy to meet such conditions.

In direct climb the helicopter has the inherent advantage over the airplane that it has no great aerodynamic resistance to overcome—the power goes directly into work against gravity. The theory has often been advanced that a propeller works better in a side wind—and that oblique climb would be more efficient than vertical climb. Experimental results have also been interpreted with the same conclusion. But there is a fallacy involved in such reasoning.

It is true that in a side wind less power is required to give a certain thrust than when the airscrew is lifting and working direct into the wind. But there is in reality more power required to overcome the lateral resistance of the airscrew and when this is taken into account the fallacy becomes immediately evident.

Vertical Descent with Dead Motor

The limit of speed is fixed by (1) physiological considerations, (2) by the factor of safety of the helicopter structure and (3) by the character of the shock-absorbing mechanism. The possible limit of vertical speed in a fall is generally estimated at about 16 ft./sec., corresponding approximately to a fall of 4 ft.

Much effort has been spent by designers to secure increased parachutal effect from the airscrew in vertical descent, by increasing the number of blades, for example. The difficulty is that even on the Newtonian hypothesis—that particles of air striking a disk are deflected—at right angles to their original path, the maximum resistance of a disk is small. The most skilful design of airscrew is not likely to secure more than the resistance of a disk normal to the wind which is only 60 per cent that calculable on the Newtonian hypothesis. Such values have already been attained with specially designed airscrew brakes, rotating like windmills on descent, but for a 2000 lb. helicopter, a diameter of 83.5 ft. is necessary to limit vertical velocity to the above figure of 16 ft./sec.

Ordinary lifting airscrews give almost negligible parachutal values in vertical descent, and to increase parachutal values the inclusion of reversible pitch is absolutely essential. When the airscrew is reversed it will indeed behave as a windmill brake. Even with the provision of a reversible pitch mechanism, the possibility of obtaining vertical descent with a dead motor is not very promising, unless huge and unwieldly airscrews are used, which would destroy the general utility of the helicopter.

It has been suggested by a number of writers that by a process analogous to the flattening out of an airplane after a glide, the angle of the airscrew blade might be manipulated on landing. On the descent the blades would be rotated to a small negative angle with the plane of rotation so as to secure the maximum drag coefficient. Shortly before landing the pilot would set the blades at a positive angle to the plane of rotation, and it would behave again as a lifting screw. This seems to be a very practical suggestion, and if lifting airscrews are indeed provided with a variable pitch mechanism, there is no reason why this maneuver should not be resorted to. If practical, the diameter of the airscrew could be cut down.

When an airplane engine stalls on the take off near the ground, the pilot may have but little time to bring his machine to a gliding attitude. If the helicopter engine stalls near the ground the difficulties will be equally great. Reliable and very rapid control of the variable pitch mechanism will be required. Clutches may also be necessary, so that the engine may be instantaneously disconnected when the airscrew is converted into a windmill, and zero torque is required to secure the greatest drag coefficient.

Oblique Descent with Dead Motor

With the motor dead, the more promising method would seem to make a gliding descent with the airscrew acting as a windmill. The ordinary lifting airscrew on gliding descent behaves very unsatisfactorily, with low values of equivalent lift/drag for the system, and with vertical components in descent actually greater than in vertical descent. The most

*Abstract of a paper read before the American Society of Mechanical Engineers.

necessary research at the moment is therefore the study of windmill brakes in oblique descent. Unfortunately, while this experimentation is comparatively simple, nothing much has been done in this direction.

Wind tunnel tests of La Cierva's Autogiro have shown extraordinary efficiency for his type of windmill-airscrew in vertical descent. If the values given in his wind tunnel tests are indeed attainable with a windmill type of airscrew in oblique descent, it would be possible with a 2000 lb. helicopter to glide on a steep path of 33.2 deg. with a vertical component of velocity of 16 ft. and with a diameter of only 30.6 ft. as compared with one of 83.5 ft. necessary for the best windmill-brake in vertical descent.

Forward Speed and Efficiency in Horizontal Flight

It has been shown by several investigators that for a given torque and r.p.m., the thrust along the airscrew axis increases with forward speed. From this it has been argued that a helicopter would be extremely efficient in forward speed. This is based on faulty analysis.

The best method of approaching the problem is again to treat the airscrew as a lifting surface, and to consider work done in overcoming forward resistance as well as the work done in imparting thrust to the airscrew. A close study of such experimental work as is available, shows that higher efficiency may be secured in forward flight by using an inclined airscrew rather than an airscrew with its plane of rotation parallel to the side wind in combination with an auxiliary propulsive airscrew.

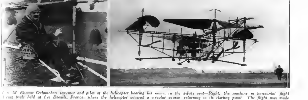
A helicopter airscrew with its plane of rotation inclined 10 deg. to the relative wind should have an efficiency or effective L/D of 8. Granted that an inclined airscrew is used, that the parasite resistance is kept down, and that the diameter of the airscrew can be kept within reasonable dimensions by windmill action on oblique descent, there is no reason to doubt that fair speeds could be secured with a helicopter satisfactory in other respects.

For example, if it were possible to build a helicopter weighing 250 lb. with a 200 hp. engine, and an equivalent parasite resistance of 15 sq. ft. (more than that of the DH4 airplane) it would be possible to obtain a speed of approximately 78.5 mi./hr.

Stability and Control

Stability in the helicopter will have to be secured by systematic study in the wind tunnel, with a sound theoretical treatment to go with the experimentation, and such matters as the dihedral disposition of two airscrews thoroughly investigated. It seems ridiculous to expose helicopter pilots to great hazards in their first painful efforts, when with some prudent wind tunnel-work a machine fairly stable under all conditions might be readily evolved.

The question of control, on the other hand, is one to be decided by practical rather than theoretical consideration. There seems no reason, however, why complete control under all circumstances should not be more readily secured than stability. For rapid forward flight the requirements are not unlike those of an airplane, and systems of control readily suggest themselves. For the ailerons there can be substituted variation in pitch of the lifting airscrews on either side of the longitudinal axis, or else movable fins or plates placed in the slipstream of the propellers. In forward flight a vertical rudder would be just as effective as on the air plane. So would an elevator.



Left, M. Etienne Oehmichen, inventor and pilot of the helicopter bearing his name, in the pilot's seat—Right, the machine in horizontal flight during trials held at Les Breuils, France, where the helicopter covered a circular course returning to its starting point. The flight was made at an average height of from 10 to 15 ft.

In hovering, or vertical flight, an auxiliary elevator airscrew with variable or even reversible pitch would seem to be necessary, as also a steering airscrew. The question of control would seem to offer a wide scope for inventiveness and mechanical skill. Perfectly realizable, helicopter control is always likely to be more complicated and less certain than that of an airplane. A duplicate system of controls—one for forward flight, one for hovering—might conceivably be necessary.

Conclusions

While predictions in matters regarding the helicopter are rash, it is safe to say that three lines of development are definitely open. (1) The combined helicopter-airplane, (2) the multiple-engined helicopter, and (3) the helicopter with gliding ability by virtue of windmill action of the reversed-pitch airscrews.

The combined helicopter-airplane, of which the Berliner is an excellent example, is a thoroughly practical proposition. Since descent with motor dead is taken care of by airplane wings, comparatively small airscrews need be provided. This means general compactness of design, high values of V/nd, and ultimately good efficiency in forward flight. Also, since descent is taken care of by gliding planes, the main lifting screws do not need variable pitch, and the mechanism is reduced to a simple speed-reduction and power-transmission problem. Mechanical simplicity is thus assured. This type of craft is not so likely to be very efficient in vertical climb, since it will have a very large wing surface resisting upward motion. The climb of a helicopter-airplane will be more analogous to that of an ordinary airplane. On the glide, it is not to be hoped for that this type will be as efficient as an ordinary airplane. In hovering, more power is likely to be required than in the helicopter proper. The combined helicopter-airplane, while the most readily realized, may be said to depart from the ideal conception of a helicopter, which can rise vertically with ease and descend with motor cut out, either vertically or on a very steep path. It may be a very valuable compromise between the airplane and the helicopter proper.

The multiple-engined helicopter has never been seriously attacked. Damblanc's "Alerion," with its two motors, each capable of driving the two sustaining airscrews, is the nearest

approach to such a type. A machine is conceivable with, say, six small independent power units. On descent, reliance could then be placed entirely on the power plant. The airscrews could therefore be of the small dimensions needed for compactness and efficiency in forward flight. Variable pitch for the main lifting screws could be eliminated. The multiple power plant has difficulties and complications of its own, but the type is well worth considering It should give us the closest approach to the ideal helicopter, and possibility of good speed as well as climb. The aerodynamic problems would be somewhat minimized.

The third type is the one which has received most attention hitherto, and such designs as those of De Bothezat and Damblanc show that it is practically realizable. It should be possible with this type to secure control, stability, excellent vertical climb, hovering flight, moderate forward speed, and, provided suitable windmill action can be secured, a steep safe descent with motor out of commission. It will be more complex than the first two types, with variable-pitch propellers as an absolute necessity It will approximate to the ideal helicopter more closely than the combined helicopter-airplane, less closely than the multiple-engined type Besides its inevitable complexity, it is never likely to achieve great forward speed, and its load-carrying capacities are likely to prove disappointing In spite of these difficulties, it may be developed because it does not involve the disadvantage of multiple engines and because it does approximate to the ideal helicopter

A Plausible Design

Some plausible calculations by the author indicate that with a 200 hp motor a helicopter of this type could be built to weigh about 3000 lb carrying a man and a couple of hours' fuel load, be equipped with two main lifting airscrews of 30 ft. diameter each, climb vertically at 500-600 ft./min., have a forward speed of 60 mi/hr, and glide down safely with motor dead on a path of 30 deg to the horizontal, at an angle of incidence of 30 deg so that the craft would maintain a horizontal position on the glide, and come to rest very quickly after touching the ground

There is no doubt that any of the three types discussed above can be realized in practical form, and that the general characteristics of the helicopter are already well understood. Given more fundamental work in the wind tunnel and financial support, aeronautical engineers will readily produce a workmanlike craft

It is also suggested that aerodynamic research be conducted before the construction of full-sized machines is undertaken. Langley and the Wrights undertook such investigation before building their flying machines. Surely the wind tunnel should now be called upon for investigating stability, windmill action in gliding descent, conversion of a lifting airscrew into a windmill, and efficiency of the lifting airscrew in forward flight.

Potentiality of the Helicopter

The helicopter is not likely to equal the airplane in speed or in carrying capacity Owing to the large airscrew diameters required, it is not likely to be so compact or maneuverable. With motor dead, however, it should be able to land in worse and more restricted terrain, and that is an important point from the safety aspect. But the airplane has only one mechanical contrivance of any complexity. the engine. The helicopter with multiple-engine power plant will have reduction gearing (10 to 1, or thereabouts) to contend with, and a complicated system of control. The single-engined helicopter will have to include a variable-pitch mechanism in addition. The airplane engineer builds a structure which glides through the air, but with its parts stationary relative to one another In the helicopter weight limitations and the flexibility of a light, huge device will make all the mechanical problems of transmission, etc, particularly difficult, and such difficulties militate against safety

The future of the helicopter, unless it undergoes radical development, therefore lies not in competition with the airplane, but in its ability to perform certain functions which the airplane cannot undertake.

Before the complete development of a new mechanism of transportation, it is impossible to predict all the uses to which it may be put. It is doubtful whether the Wrights foresaw the application of the airplane to fighting the boll weevil, or making air surveys for laying down power-transmission lines. By analogy, the helicopter, once it has been developed, may be utilized in ways quite unsuspected by us at present There is no lack of plausible suggestions for its utilization In military use for observation purposes, to replace kite balloons or over areas where extremely accurate information is required; for securing communication between army units which cannot maintain airplane contact owing to topography; for accurate bombing of either land or sea objectives; for use in connection with naval vessels not supported by aircraft carriers. Enthusiastic supporters of the helicopter go so far as to see it landing on roofs, bringing rapid communication to the very heart of cities and helping to relieve traffic congestion—although airplanes with landing platforms may more readily achieve this.

At any rate, the helicopter is within measurable distance of achievement, and is worthy of serious consideration.

Amundsen's Plans

Roald Amundsen's two machines for his North Pole flight were loaded March 5 aboard the Norwegian steamer Liverno at Oslo, to be transported directly to Tromsoe, from which point the Arctic ship Hobby is ready to leave immediately for Kings Bay, Spitzbergen

Mr Amundsen said in a recent interview "The Norwegian Aero Club wished to help me, but it met with difficulties and I had to go to the United States, where I met with success. I met the American explorer Ellingworth, who wanted to take part in the flight to the Pole and offered me $85,000. The offer was accepted, and thereby was laid the economic base for the expedition

"Dr Raestad, former Foreign Minister of Norway, took over further organization of the project. The technical preparations were made by two Norwegian naval fliers—Lieutenants Dietrichsen and Ruser-Farson—who will lead the expedition to the Pole. The Dornier Wal type of seaplane was chosen as being the best type of machine for the difficult conditions they will encounter The planes were ordered from the Dornier people in Friedrichshafen and built at their factory in Marina di Pisa, Italy Each is equipped with two 370 hp Rolls-Royce engines.

"At the beginning of May, when all the trials will be made, the base will be moved from Kings Bay to North Spitzbergen, where there is a large meteorological station

"When all is ready and the weather is favorable, we will cut loose That is all I can say. We will take enough provisions to last each person a month and also skis, arms, light boats and whatever else is necessary, so we will be prepared if we have to return over the ice

"In a plane similar to the ones to be used on the polar flight Richard Wagner, the German aviator, has already broken twenty world's records for endurance, altitude and distance."

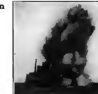
Chicago Aviation Ball

On March 2 the Trianon Ballroom of Chicago held an Airplane Ball in cooperation with the Chicago Aviation Company The main event of the evening was the presentation of a Jennie to one of the dancers. The affair was well attended, there being over 4,000 present and two dance orchestras to take care of the crowd

Many distinguished aviators and Air Service men were present, among them Maj. William C McChord who flew in his DH from Rantoul for the event. Maj H. J. Martin, Air Officer, 6th Corp Area, was present and also Captain Heptig recently elected president of the Chicago Chapter of the N.A.A., and Capt. J A. Yonge of the R.A.F The dance was held for the purpose of popularizing aviation in Chicago and many expressions of favorable comment led to the belief that Chicago will give a good account of herself in the air this season.

U.S.S. Washington

These pictures of the sinking of the battleship Washington are reproduced through the courtesy of N. Y. American Photos. They show the battleship before the bombing, two of the static charges that were placed alongside exploding, the ship listing heavily and finally rolling over on her side. As the bombing of this ship extended over several days and it was subjected to gun fire as well as static underwater explosive, our readers will have to draw their own conclusions as to which caused the actual sinking.



(c) N. Y. American Photos

Hooking an Airplane to an Airship

Experiments Conducted by the Army Air Service at Langley Field and Scott Field Show the Practicability of both Landing at and Taking off an Airship

The proposition of hooking an airplane to an airship was considered by the Army Air Service as far back as 1921. It was a pet scheme of Lawrence Sperry, the noted inventor and builder of the Sperry Messenger, who was drowned while attempting to cross the English Channel last year. So far as available records show, the matter was first discussed with Mr. Sperry on Sept. 28, 1921, during a conference at Bolling Field, participated in by several Air Service officers including the late Lieut. Robert S. Olmstead, and Mr. Stone of the Navy.

Lieutenant Olmstead, in reporting on the feasibility of the project, stated that the Sperry Messenger plane was peculiarly well adapted for carrying on the experiment, principally due to the fact that the engine starts very easily, is extremely reliable in this respect, and it is possible to start it under all conditions of temperature. In enumerating the tactical uses of an airplane such as the Messenger in conjunction with the operation of airships, Lieutenant Olmstead stated that in coast patrol work an airship operating at 200 mi. off the coast could release planes of this type to carry messages back to bases ashore, that such planes might be released for purposes of inspecting various suspicious looking craft visible to the occupants of the airship to determine whether they were friendly craft or otherwise, for it would be impossible to send an airship sufficiently close to suspicious looking craft to make sure of their character without exposing it to anti-aircraft fire and possible destruction, that in conjunction with land operations of larger airships such planes would be very useful in arranging for landings at places where there were no personnel trained in the manipulation of airships, for the pilot of the plane could land and take charge of landing the airship or, in case landing was not possible, he could return to the airship, explain the situation to its commander, and arrangements could be made to land in another location, that in actual warfare it would be practicable to utilize these planes to act as scouts for the airships and give timely warning of the approach of enemy planes or airships.

First Trials

On July 17, 1922, at the Aberdeen Proving Grounds, Md., an unexpected meeting took place between the Airship C2 and the Sperry Messenger. Lieut. Max F. Moyer, A.S., was cruising about over the Chesapeake Bay on a test flight when Mr. Sperry in his Messenger came alongside the C2 and signalled that he would like to conduct some tests. Lieutenant Moyer readily understood his signals, inasmuch as he had talked over the proposition with Mr. Sperry some months previously. The airship was held on a straight course at an altitude of 1200 ft. and Mr. Sperry then came up under the car of the airship, cut the speed of the Messenger to that of the C2 and gradually gained altitude. After a very few minutes of practice he was able to bring his plane to within 8 or 10 ft. of the bottom of the car and to hold his altitude, course and speed without varying his position in relation to the airship in the least degree. The atmospheric conditions under which the experiment was conducted were those usually found in a clear day over a large body of water. To demonstrate the maneuverability of the Messenger, Mr. Sperry pulled up opposite the C2 and holding a constant speed and course, gained or lost altitude or held his altitude at will.

At Langley Field, Va., on Sept. 18, 1923, an attempt was made to make contact between an airplane and an airship which was not a complete success, for the reason that the Sperry Messenger was unable to reduce its speed sufficiently to hold the contact and the airship, Type D, was able to attain only a speed of 47 mi./hr., due to faulty engines. Lieut. R. K. Stoner piloted the Sperry while Maj. J. H. Jonbett and Lieut. J. A. Smith were the pilots of the airship and Lieut. F. W. Evans the observer. The test was conducted at 2,000 ft. altitude. As a preliminary test, the plane approached the trapeze and passed it with the contact stick within about four inches of the trapeze bar. On the second test the stick made contact with the bar but, due to the difference of 17 mi. between the speed of the airplane and the airship, the shock absorber cord holding the stick in an upright position was broken when the contact was made, allowing it to fall to a horizontal position.

Airship Improved

New engines were installed in the airship, and on Sept. 24 a second test was made, Lieutenant Stoner again piloting the Sperry and Lieutenant Smith the airship, with Lieutenant Evans as observer. At an altitude of 2,000 ft. the air speed of the airplane was 60 mi./hr. and that of the airship 57 mi./hr. The trapeze was first approached by the plane at the level of the bar and while contact was made it was not maintained for more than three or four seconds. On the second attempt the plane approached the trapeze until within about 200 ft. of it and a level of about 30 ft. below it when the plane started to climb. This proved to be highly successful, as the stick was brought into contact with the bar and held there for about one minute. While this contact was being maintained the pilot of the plane experimented in sliding the stick up and down the bar in order to ascertain the feasibility of actually attaching the plane to the ship. No difficulty was experienced in this.

During the Pulitzer Races at Dayton, Ohio, on Oct. 3, 1924, another experiment was tried out which was somewhat different from those previously conducted. This time the airship took off with the airplane attached to it and at a certain altitude the pilot of the plane started his motor, unhooked the plane from the airship and went on his way. This is probably the first instance on record in aviation that an airplane actually took off from the air.

The airplane was piloted by Lieut. C. V. Finter, and the crew of the airship consisted of Capt. E. W. Hill, directional pilot, Lieut. F. M. McKee, altitude pilot, one engineer and one rigger. The airship was trimmed horizontal and 150 gal. of gasoline were carried. The attaching device or trapeze bar, extending about nine feet below the car and secured to the bomb racks, was attached while the ship was in the mast. Brace wires were assembled and properly adjusted and then the forward ones were released in order that the trapeze might be swung up close to the car and not be injured as the ship was being taken out of the mooring mast and maneuvered to the flying field.

Handling Details

After maneuvering the ship to the flying field it was weighed off about 1200 lb. light, engines warmed up, trapeze bar dropped into position and secured. The plane was then maneuvered alongside the car and the airship allowed to rise until clear of the plane and then placed in position over the plane. Quite a bit of difficulty was experienced in this maneuver owing to the fact that it was almost impossible to keep the airship under control and avoid injuring the plane when the airship was forced down due to gusts and eddies. The airship car being so high there was no way of holding it up off the plane. Some slight damage was done to one wing of the plane, but this did not affect its operation in any way.

As soon as the plane was hooked on the order was given to let go and the airship free ballooned about 15 or 20 ft. before the engines were opened up. No difficulty was experienced from then on. An altitude of about 160 ft. was maintained for approximately the full length of Wilbur Wright Field and then a climbing turn was made until an altitude of 1500 ft. was reached. The airship was then headed

...ly into the wind and the engines opened full throttle. The pilot of the airship had requested Lieutenant Finter to ...g off either to the right or left immediately after re...ing from the ship in order that, if necessary, he could ... the ship down at a steep angle with no possibility of ...king or interfering with him in any way.

There was no prearranged signal for letting go other than ... Lieutenant McKee to signal Lieutenant Finter when an altitude of 1500 ft. was reached. This was done and shortly afterwards Lieutenant Finter released the plane, a fact which the airship pilot did not realize until he had looked over the ... and saw the airplane about a hundred feet below and to the left. It was a matter of at least a minute before he felt the static effect of the loss of the plane. This was not particularly great owing to the fact that the engines were wide open. The airship did not gain altitude or become unmanageable in any way. At no time either while carrying the plane or after its release was any difficulty experienced in handling the airship. Lieutenant Finter stated that he at all times had perfect dynamic control of his ship and could slide it either to the right or left on the bar by a slight movement of the rudder and could use his elevators in elevating or depressing the nose of the plane. The airship pilot expressed his belief that attaching the plane in the air would be a great deal more simple, with less possibility of injury to either the personnel or aircraft as by taking off from the ground about ...00 or 600 lb. light it would be comparatively easy to pick the plane up except on a very bumpy day.

Scott Field Tests

"Practically any airplane can be hooked to an airship while in flight, provided the latter can maintain her speed of approximately five miles greater than the stalling speed of an airplane." This is, in substance, the conclusion arrived at ... the result of the experiment recently conducted at Scott Field, Ill., of hooking on an airplane to an airship. Further experiments along this line are contemplated with the purpose in view of modifying the design of the hooking-on and releasing apparatus and of determining the limits of lightness and heaviness of the airship for successful hooking on and releasing.

The Engineering Division at McCook Field, Dayton, Ohio, submitted an interesting detailed report on the experiment at Scott Field and while considerable publicity has appeared in the newspapers on this unique feat, it is believed that the detailed report quoted below will prove of interest to our readers.

Equipment used in experiment.—Airship TC3; Messenger airplane. The airship was equipped with the trapeze and the Messenger airplane with the hook, furnished by the Lawrence Sperry Aircraft Company, Inc. A fixed trapeze was used. It was braced fore and aft by two cables in each direction, leading from trapeze to suspension clips on airship car, the Fokker type of trapeze bar was employed in this experiment, as it is better designed to take up not only upward thrust from the airplane, but also the forward momentum and drag of the plane when suspended on this bar in flight.

The trapeze and accessory equipment had been previously shipped to Scott Field and installed on the TC3 airship, while the Messenger airplane, due to the fact that the hook installation prevented putting in a large capacity gasoline tank, was shipped by truck to Scott Field and there set up and made ready prior to the following personnel leaving McCook Field for that station for the purpose of carrying on and supervising the experiment. Maj. H. A. Strauss, A.S., was sent to Scott Field as the Engineering Division representative, Lieut. C. V. Finter, A.S., as pilot of the Messenger plane, Lieut. W. L. Boyd, A.S., as pilot of photographic plane, and Lewis Hagemeyer, Engineering Division employee, for the purpose of taking moving pictures of the experiment.

The airship took off and ascended to an altitude of approximately 2000 ft., and then leveled out, whereupon Lieutenant Finter cruised alongside to get an estimate of the speed of the airship in comparison with the stalling speed of the Messenger plane. Immediately after this he circled around and came up underneath and from the rear, toward the trapeze. After maneuvering for a few moments, he got the plane in the proper position for hooking on, when a small bump threw the plane up and caused the guide bar on the hook to strike the trapeze, which only resulted in forcing the plane down 100 ft. or so. Lieutenant Finter immediately climbed the plane and made another attempt but the same thing happened. On the third trial, a bump forced the plane up and the propeller struck the trapeze and broke, necessitating his return to the ground.

Three things contributed to the failure of this first experiment — (a) The airship was about 1000 lb. light at the altitude where the experiment was attempted, and could not be flown on a level keel without ascending, and when it was nosed down to counteract for the excess lift, it had a tendency to creep up or down. (b) The air was bumpy. (c) It was found that if the plane climbed up to the proper height to hook on, but was a distance greater than two feet in rear of the trapeze, the slipstream from the airship's propellers caused considerable difficulty in controlling the airplane.

Arrangements were made to secure spare propellers from McCook Field and in an effort to avoid any further delay, an old propeller from the OA1 airship was tried out on the Messenger plane and, while only turning over 1450 r.p.m. with throttle full out, Lieutenant Finter decided to try again on the afternoon of the fifteenth if the weather permitted.

On the afternoon of Dec. 15 the airship was taken out and weighed off approximately 250 lb. light and proceeded to climb to 1500 ft., which had been decided upon as sufficient elevation. Lieutenant Finter in the meantime had taken off in the Messenger plane and maneuvered around in the same manner as during the first experiment, and when he was signalled that the airship was steady on the course, he maneuvered his plane up under the ship in the same manner as on the previous occasion, and with no apparent trouble or delay of any kind, hooked the plane on the trapeze, but his forward speed was greater than the designated five miles an hour, and the hook functioned imperfectly, releasing and permitting him to fly in through. The same difficulty was encountered in the second attempt. But on the third trial he flew the plane up and made a perfect hook-on. The airship was then turned and proceeded toward Scott Field carrying the airplane on the trapeze until at a point about a mile from the hangar, when Lieutenant Finter released the hook and flew directly toward the landing field where he landed.

On the trials of this date, the fact that the airship was practically in equilibrium did away with the difficulties noted above. The air was very smooth, and as the pilot climbed the airplane steeply directly under and in rear of the trapeze no difficulty was experienced on account of the slipstream from the airship's propellers.

Both the hooking-on of the airplane and its release occurred so easily and without appreciable effect on the airship that the pilot was unaware of the time of occurrence of each, and the only appreciable difference in carrying the airplane was to be noted in the increased drag and lowering of the air speed of the airship.

The hook-on was accomplished with the airplane going at full speed—indicated air speed 62 mi./hr., ground speed approximately 54 mi./hr. and the airship at an indicated air speed of 51 mi./hr. and a ground speed of approximately 45 mi./hr.

Conclusions

The conclusions based upon the above experiment are:

That practically any airplane can be hooked on to an airship while in flight and without any difficulty whatsoever, either as regards the plane or the airship, provided the latter can maintain an air speed of approximately 5 mi. greater than the stalling speed of the airplane.

Using equipment of the same type or similar to that employed in the above experiment, no difficulty may ordinarily be expected as regards striking the trapeze bar with the propeller if the pilot will always keep the hook and trapeze bar in line and pay no attention to either the propeller or the guide bar on the hook.

Stability and Controllability of Airplanes

Appendix I. Conclusion and Sample Calculation

By B. V. KORVIN-KROUKOVSKY

To analyse the variation of p we will expand it in terms of the lift and moment coefficients using the same relation explained in the beginning of this article,

$$p = l\frac{p}{l} = l\frac{C_m}{C_l}$$

$$\text{hence}\quad \frac{dp}{dC_l} = l\,\frac{C_l\frac{dC_m}{dC_l} - C_m}{C_l^2} = \frac{lm}{C_l} - \frac{l\,C_m}{C_l\,C_l}$$

$$[4]\quad \text{or}\quad \frac{dp}{dC_l} = \frac{lm}{C_l} - \frac{p}{C_l}$$

In order to investigate the increment of the air force on the tail Δf we must take into account the slope of the lift coefficient curve plotted against the angle of attack for the wings and empennage, i.e. the values of $dC_l/d\alpha$ and $dC'/d\beta$, as well as the effect of the downwash of the wings. The latter makes the angle of attack of the empennage β vary less than the angle of attack of wings α varies, and consequently decreases the effectiveness of the empennage. The examination of the sketch of the diagrammatic airplane allows us to write the following relation between the angles:

$$\beta = \alpha - \delta - \varepsilon$$

where all angles are expressed in degrees. We mentioned above that the lift of an airfoil for the moderate angles of attack is the linear function of the angle, and therefore can be expressed by the equations

$$C_l = a + n\alpha \quad\text{and}\quad C' = a' + n'\beta$$

where $n = dC_l/d\alpha$ and $n' = dC'/d\beta$. The constants a and a' are of no interest to us in this connection. Then we can write the following expression for α:

$$\alpha = \frac{C_l}{n} - \frac{a}{n}$$

The angle of the downwash ε is the function of the lift coefficient C_l and the effective aspect ratio R, and depends somewhat on the location of the empennage with respect to the wing. Lieutenant Diehl in N A C A Tech. Note No. 42 gives the following empirical formula for the determination of ε:

$$\varepsilon = \frac{170}{R}(x+1)^{-1/4}(y+1)^{-1/4}C_l$$

where x and y are the ordinates of the point considered with respect to the trailing edge of the wing and are expressed in terms of the wing chord. For our purpose it will be sufficiently accurate to assume the average value of $y = 0$ and $x = 2$. Evaluating these and substituting $C_l = 2L_c$ we get simplified relation

$$\varepsilon = \frac{56}{R}C_l$$

If we substitute now the values of α and ε in the expression for β we get

$$\beta = \frac{C_l}{n} - \frac{a}{n} - \delta - \frac{56}{R}C_l$$

Now we can substitute this value of β in the expression for C', for simplicity grouping all constants together

$$C' = C_l\left(\frac{n'}{n} - n'\frac{56}{R}\right) + \text{Constant.}$$

The slopes of the lift coefficient curves plotted against the angles of attack n and n' are found to vary but little with different wing sections and for all practical purposes can be taken to depend only on the aspect ratios of wings and empennage. The relation between the values of n and n' and corresponding aspect ratios can be very closely approximated by the simple expressions:

$$n = \frac{dC_l}{d\alpha} = \frac{0.1}{1 + \frac{2}{R}} \quad\text{and}\quad n' = \frac{dC'}{d\beta} = \frac{0.1}{1 + \frac{2}{R'}}$$

We will remember that the effective aspect ratio is defined as the overall span squared and divided by the total wing area. The biplanes in this respect are equivalent to the monoplanes of slightly larger span — kb. The coefficient k depends solely on the ratio of mean gap to the span — G/b. Dr Munk gives the following Table for the values of k:

Ratio G/b	Value of k
0	1.00
0.05	1.02
0.10	1.05
0.15	1.08
0.20	1.12
0.30	1.21

Substituting now the values of n and n' in the expression for C' we get finally the expression for $\Delta C'$ in the form convenient for differentiating with respect to C_l:

$$[5]\quad \Delta C' = \Delta C_l\left(\frac{1 + \frac{2}{R}}{1 + \frac{2}{R'}} - \frac{5.6}{R\left(1 + \frac{2}{R'}\right)}\right)$$

It remains now to investigate the variation of the propeller thrust with the variation of the lift coefficient. The propeller thrust varies with the speed (hence with C_l) due to variation of the ratio V/ND, as well as due to variation of the engine r.p.m. and power output, and to study its effect without excessive complications we will have to resort to entirely empirical methods. In the course of performance calculations, the power delivered by the propeller at different velocities of flight is often determined on the basis of wind tunnel tests on propellers by means of the logarithmic charts of Professor Durand. If the propeller thrust so determined be plotted against velocity of the flight for the range from 40 to 110 m/hr., it will be found that the curves for different engine-propeller combinations will present nearly straight and parallel lines closely grouped together. With sufficient degree of accuracy for our purpose the average thrust can be expressed therefore by the linear equation

$$T = P\,(4.0 - 0.013\,V)$$

where T is the actual thrust in pounds
P is the rated horsepower of the engine (constant)
V is the velocity of flight in feet per second.

Substitute in the above equation the value of V in terms of C_l

$$V = \sqrt{\frac{2}{\rho}\frac{W}{S\,C_l}}$$

bring out $qS = W/C_l$ and evaluate $\rho = 0.00237$ assuming the condition of the flight at very low altitude

$$T = qS \times P\left(\frac{4.6}{W}C_l - 0.38\sqrt{\frac{C_l}{W\,S}}\right)$$

The second term in the parenthesis is very small and can be neglected. We can write therefore

$$[6]\quad \Delta T = qS \times 4.6\frac{P}{W}\Delta C_l$$

We have investigated now and have expanded in terms of C_l each of the increments in the moment equation [1], and

are ready to write the derivative dM_c/dC_l. Substituting the expressions 2, 3, 4, 5 and 6 into equation 1, dividing through by the quantity qSl and differentiating with respect to C_l we obtain:

$$\frac{dM_c}{dC_l} = \frac{x}{l} - \frac{p}{l} - 0.25\frac{y}{l}C_l - m + \frac{p}{l} - \frac{s}{S}\frac{L}{l}\left[\frac{1 + \frac{2}{R}}{1 + \frac{2}{R'}} - \frac{5.6}{R\left(1 + \frac{2}{R'}\right)}\right] - 4.6\frac{P}{W}\frac{y'}{l}$$

The condition of stability is that this derivative must be negative. Introducing the notation $dM_c/dC_l = -N$ and evaluating $m = 0.25$ we get the following condition for stability of an airplane

$$N = 0.25 + \frac{s}{S}\frac{L}{l}\left[\frac{1 + \frac{2}{R}}{1 + \frac{2}{R'}} - \frac{5.6}{R\left(1 + \frac{2}{R'}\right)}\right] - \frac{x}{l} + 0.25\frac{y}{l}C_l + 4.6\frac{y'}{l}\frac{P}{W} > 0$$

For the convenience in use and for the ease of memorizing we can rewrite the expression for N as follows:

$$[7]\quad N = 0.25 + B - X$$

where B is the term depending entirely on the size and disposition of the empennage and on the aspect ratios of the wings and empennage. Its value is

$$[8]\quad B = \frac{s}{S}\frac{L}{l}\left[\frac{1 + \frac{2}{R}}{1 + \frac{2}{R'}} - \frac{5.6}{R\left(1 + \frac{2}{R'}\right)}\right]$$

and X is the term depending entirely on the location of the center of gravity of the airplane with respect to the leading edge of the mean chord and to the propeller thrust line

$$[9]\quad X = \frac{x}{l} - 0.25\frac{y}{l}C_l - 4.6\frac{y'}{l}\frac{P}{W}$$

That is, X, basically, is the distance of the center of gravity from the leading edge expressed in terms of the mean aerodynamic chord and further modified by its location above or below of this chord and above or below the propeller thrust line.

The constant 0.25 in the equation [1] is the *initial stability* of the wing explained earlier in this paper. It is of interest to observe that the stabilizing effect of the empennage is almost destroyed by its comparatively small aspect ratio and by its location in the downwash of the wings. The most important effect of the empennage then is *not stability, but the balancing of the machine, which allows the center of gravity to be placed in the position favorable for stability*. Of course the empennage is very important for dynamic stability supplying, as it does, practically all of the damping in pitch. These considerations are however, beyond the scope of this paper, and it will be sufficient to say here that precise calculations of Bryan and Bairstow as well as the practical flying tests showed that the machines stable statically are usually found to be stable dynamically as well.

It may be well to recall here the old and ever true condition of stability demonstrated by Dr. de Bothezat as early as 1913, namely that stabilizer chord must make an open V with the wing chord, and the sharper the angle the better for stability. In our formulas the angle of stabilizer setting does not appear explicitly. However, in order to balance the airplane with the forward position of the center of gravity required for stability by our formulas the stabilizer will have to be set at smaller angle than the wings, thus satisfying de Bothezat's condition as well. Inversely, the adoption of sufficiently small angle of attack of the stabilizer will require for balance, a forward location of center of gravity which will satisfy our formulas. Unfortunately the information required for accurate estimate of the stabilizer setting is lacking almost as sadly as that for stability. Many designers specified the correct stabilizer setting for stability, but placed the center of gravity too far back. The result was that the stabilizer setting was modified after the first test flight to give balance at some one condition without further regard to stability. It is rather common experience that unstable machines were found in the first test flights to be tail heavy. Our formulas, we hope, will allow the designer to place the center of gravity in the correct position, which will lead eventually to the correct adjustment of the stabilizer setting, whether this adjustment be made on the drawing board or on the flying field.

In order to illustrate better the practical application of the method described above, the complete stability computations are shown in the following table for one flying boat and two well known airplanes. The small negative value of the coefficient N in case of the JN4 indicates slight instability of this machine, a fact brought out before by flying tests. The large coefficient N for the Model EO flying boat shows the degree of stability which, although very desirable in low powered light machines, may prove objectionable in case of larger and heavier one. It must be noted, however, that in case of the flying boats considerable degree of stability results from the low position of center of gravity with the respect to the propeller thrust line and vanishes in the glide. For such machines the test must be applied to gliding, as well as to the flying condition by letting $P = O$. Such a test shows that the stability coefficient for the Model EO in glide is 0.08, which is still satisfactory.

Table
STABILITY CALCULATIONS FOR 3 MACHINES

Data Required				
Machine		I	II	III
1—Weight in lb.	W	1410	2108	2138
2—Engine horsepower	P	72	150	150
3—Wing area in square feet	S	288	284	353
4—Empennage area square feet	s	32.3	34.7	30.3
5—Overall span in feet	b	28.3	34.1	43.3
6—Empennage span in feet	b'	10.0	12.3	10.3
7—Mean aerodynamic chord in feet	l	4.3	4.8	5.0
8—Mean gap in feet	G	4.3	4.7	4.8
Location of Center of Gravity				
9—Relative to M.A.C.	y in feet	1.8	1.4	2.6
10—Relative to thrust line	y' in feet	2.7	0	—0.3
11—From leading edge of M.A.C.	x/l	0.33	0.30	0.33
12—From C.P. of empennage	L in feet	13.7	16.3	15.0
13—Angle of attack in degrees	α	4.3	2.0	2.5
14—Lift coefficient	C_l	0.83	0.22	0.22
Calculations of B:				
15—Gap to span ratio	G/b	0.15	0.13	0.11
16—Coefficient	k	1.07	1.07	1.05
17—Effective span	kb	30.7	36.5	46.2
18—Effective aspect ratio	R	3.2	4.7	6.0
19—Empennage aspect ratio	R'	3.1	3.1	2.1
20—$(1 + 2/R)/(1 + 2/R')$		0.81	0.87	0.68
21—$5.6/R\,(1 + 2/R')$		0.55	0.72	0.48
22—[20] minus [21]		0.26	0.15	0.20
23—sL/Sl times [22]	B	0.09	0.08	0.03
Calculations of X:				
24—Effect of $y = 0.25y/l$ times C_l		0.07	0.03	0.02
25—Effect of $y' = 4.6y'/l$ times P/W		0.13	0	—0.02
26—x/l — [24] — [25]	X	0.11	0.27	0.33
27—$0.25 + B - X$	N	0.23	0.04	—0.05

I—Tractor Sport Flying Boat Model EO built by the Aeromarine Plane and Motor Co. for E. D. Osborn, and described in Aug. 11, 1924, issue of AVIATION.

II—Vought VE7—Data are taken from the N.A.C.A. Rep. No. 96.

III—Curtiss JN4 with Hispano-Suiza 150 hp. engine. Data are taken from N.A.C.A. Rep. No. 70.

In the case of all three machines it was assumed that the thrust line coincides with the direction of the flight and that the engine is running wide open. This means, of course, the condition of moderately steep climb.

(To be continued)

Russia Buys Airplanes

It is reported that the Russian air program for 1925 provides for the acquisition of 1030 new airplanes, of which number 500 are to be built in Russia, chiefly by the Russian Junkers Co., 330 are to be ordered from the Fokker Co. and 200 from several Italian firms. During the first six months of 1924 Russia purchased about 700 modern aircraft in Holland and Italy.

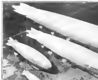
U. S. Loses Many Seaplane Records

A Dornier Wal two-engined flying boat with W[illegible] as pilot has made a series of new world's records at Marina di Pisa, Italy. The records are for speed, distance and altitude carrying weights of 250, 500, 1000, 1500 and 2000 kg. The course flown was laid out in Livorno, Gorgona and Vareggio. The flights were observed by representatives of the Aero Club of Italy and will be forwarded to the F A I for homologation. In order to save space the figures are shown in the following table

[illegible]	[illegible]	[illegible]	[illegible]

Goodyear Airships

The accompanying illustration shows the world's smallest airship and the world's largest Zeppelin as they will appear when completed in comparison with the United States naval airship Los Angeles and the Army semi-rigid air cruiser [illegible]



From left to right The Pony Blimp The U S Army RS 1 The U S Navy Los Angeles and the proposed Goodyear Zeppelin

The little Pony Blimp, in the immediate foreground, is now under way in the aeronautical workshops at Goodyear in Akron, and will be completed early this spring. When finished this non-rigid dirigible airship will be 100 ft long and hold 47,000 cu ft of gas in its envelope. The enclosed cabin will have accommodations for three passengers and a pilot.

In contrast is the giant airship which will dwarf even the 656 ft Los Angeles, and is now being designed in Akron, Ohio, by Dr. Karl Arnstein, of The Goodyear Zeppelin Corp., and his staff of engineers. The mammoth air liner now in prospect is to be more than 900 ft in length and will hold over 5,000,000 cu ft of gas in the cells inside the hull. It is being planned for long non-stop journeys and will have facilities for the transport of passengers, express and mail. The RS1, America's first semi-rigid ship, shown between the Pony Blimp and the Los Angeles, is 282 ft long and has a gas capacity for 719,000 cu ft. It was constructed for the Army Air Service by The Goodyear Tire & Rubber Co. in Akron, Ohio.

New Junkers Transport Plane

The Junkers Werke of Dessau, Germany, have recently produced a new airplane the G23. This machine is an outgrowth of the F13, known in this country as the JL6. In general outline the new design is simply an enlarged F13 with two engine nacelles on the leading edge of the wing. The span is 95 ft, the overall length 52 ft 6 in, and the height 18 ft. The cabin has a seating capacity of nine with a lavatory and a baggage compartment behind. There are two pilots with dual control. A corridor provides communication from the pilots' cockpit to the cabin.

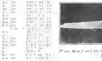


Photo Kadel and Herbert

Rear view of the Junkers G23

This type has received approval from the Allied Commission when fitted with the following engine combinations. As type G23W, it has one Junkers L2, 195 hp and two Mercedes D IIa, 160 hp engines, giving a total of 515 hp. With this combination it carries a total weight of 11,600 lb at between 100 and 105 mi/hr. As type G23L, it is equipped with one Napier Lion, 450 hp and the weight empty is 6,330 lb, the speed remaining the same. Type G23bL has only two Junkers L2 engines, total 390 hp and as type G23H, with one Junkers L2 and two Mercedes D1, 100 hp each, a total of 395 hp. In foreign countries this machine will probably be fitted with larger engines with a resulting increase in speed and payload.

Air Decorations Proposed

Members of the Air Service who have distinguished themselves since April 6, 1917 will be eligible to receive new decorations under the terms of a bill recently introduced in the Senate by Senator Bingham of Connecticut. He was rated an R M A in August 1917 and rose to the rank of Lieutenant Colonel during the War. He organized our ground school system and later was chief of personnel with the A E F.

This bill, known as S4408, provides for two new decorations to be known as the Distinguished Flying Cross and the Air Service Cross. Previous to introducing this bill Senator Bingham had made great efforts to secure the award of Distinguished Service Medals to the families of pilots who were killed while flying or teaching others to fly and of pilots whose daily duty at flying schools involved great hazard.

The Distinguished Flying Cross is to be awarded, under the terms of the bill, by the President to any person who, while serving in any capacity with the Air Service of the Army since April 6, 1917, has distinguished, or who, after the approval of this act, distinguishes himself by extraordinary heroism while flying in military operations against the enemy.

The Air Service Cross is awarded in the same manner to any person who, while serving with the Air Service of the Army since April 6, 1917, has distinguished, or who, after the approval of the act, distinguished himself while flying, by acts of valor, courage or devotion to duty involving great or continuous hazard.

The act further provides for the award of bars for subsequent deeds meriting the award of either decoration. The President is authorized to delegate his authority with respect to these decorations to the commanding general of a separate army or higher unit in the field. Any enlisted man who has been awarded either of these new decorations is entitled to an increase of $2.00 per month and an additional $2.00 for each bar.

Bid for Night Observation Airplane

Air Service Calls for Designs for Night Observation Pusher

[illegible] bids in triplicate, subject to the usual provisions [illegible] Regulations and accompanied by the proposed design will be received at the office of the Contracting Officer, [illegible] Division, Air Service, McCook Field, Dayton, until 10:30 a. m., May 4, 1925, for each of the following items: (a) Furnishing one wind tunnel test model of [illegible] Observation Airplane, (b) Preparing one mock-up [illegible] airplane, (c) Designing, constructing and furnishing [illegible] test, and testing, certain parts of said airplane, [illegible] after enumerated, (d) Furnishing preliminary engineering drawings and data for said airplane, (e) Designing, [illegible] and furnishing one (1) Night Observation Air[illegible]. Separate bids must be submitted for each of the above (a) to (e) inclusive, as each item will be considered and [illegible] for separately and in the order named.

The Air Service expects to purchase one or more wind [illegible] test models of those designs submitted which appear to [illegible] the most promise. However, the Air Service will not [illegible] into a contract with any bidder for more than item (a) [illegible] but it is expected to then continue with separate [illegible] for items (b), (c), (d) and (e).

[illegible] Air Service shall have the right to make reasonable [illegible] in any design submitted, in which event any bid [illegible] agreement, be increased or decreased in an amount [illegible] any anticipated additional cost or saving effected [illegible] changes. In case it is desired to incorporate in an [illegible] design any new and novel special feature used in [illegible] of another bidder, such feature may be so incorporated with the express approval of such other bidder, for [illegible] compensation to such other bidder, when such [illegible] not already in the approved design, or is not of [illegible] knowledge to the industry, or has not been published [illegible] dedicated to the public. All contracts will be [illegible] price basis and will follow the form now in use [illegible] Air Service.

[illegible] flight tests shall be made with only one design of pro[illegible], that is, the Government will not use a high speed [illegible] for speed courses and a climbing propeller for climbing.

Requirements

[illegible] is desired to obtain an airplane best suited in every [illegible] the requirements of night observation work a few [illegible] requirements are laid down as to the form the airplane should take and it is left to the designer to work out the [illegible] in the best manner possible.

[illegible] shall be of a single engined pusher type biplane. [illegible] designs would be considered which use one or more [illegible] engines, but it should be kept in mind that the [illegible] must be as small, light, and maneuverable as possible. [illegible] that if two engines are used the airplane must be [illegible] sustained flight on one engine only.)

[illegible] shall be located in a nacelle forward of the leading [illegible] the wings so as to afford unobstructed vertical vision [illegible] for the rearmost man and preferably downward [illegible] a slight angle rearward.

[illegible] overall dimensions shall be kept as small as possible [illegible] with the performance requirements set forth here[illegible].

[illegible] following is an approximate summary of the total normal [illegible] load which the airplane shall be designed to carry

	Approximate weight pounds
[illegible]	380
[illegible]	2½ hr full throttle at sea level
[illegible] 1/8th of total fuel by volume	
Ar[illegible] (1)	
F[illegible]	102
[illegible]	
Miscellaneous	234
Sp[illegible] load	50

(1) Provision shall be made to carry one hours additional fuel in an auxiliary tank

(2) Provision shall be made for the installation of Type B2 Internal Bomb Rack and four extra Airways Flares

The following performance with normal disposable load is desired at the normal r.p.m. at which the engine has passed a 50 hr. test approved by the Government, and should the airplane meet the same the contractor shall be deemed to have fully met this requirement of the specification.

High speed at sea level	125 mi /hr
Rate of climb at sea level	1500 ft /min
Landing speed not to exceed	45 mi /hr
Gliding performance shall meet the requirements of the handbook	

Should the airplane fail to meet the above specified performance, it shall be optional with the Government to purchase or reject the same, the judgment of the Contracting Officer to be final and conclusive as to the exercise of said option.

Safety

The airworthiness, handiness of control and general flying qualities of the airplane must be satisfactory to the Air Service. Design load factors of various structural parts of the airplane shall be as specified for Type O in Serial Report 2118. The safety of the crew in case of a crash should receive careful consideration and all reasonable measures should be taken to prevent injury to the crew from tanks, armament equipment and other installations. The placing of structural members in locations which might make egress difficult in case of a crash, should be avoided. In view of the above, the nacelle shall be of rigid metal construction throughout. The [illegible] shall be built rigid enough to withstand an ordinary nose-over. The engine mount is to be especially rigidly braced to hold the engine in place in case of a crash.

The contractor's attention is especially directed to the vital necessity on this type of airplane of a landing chassis specially designed to withstand severe landings at night on rough ground. It is especially desirable to reduce the roll after landing to the minimum. If a standard two wheel chassis is used the included angle between lines drawn vertical and to the center of gravity through the axle, when machine is in flying position, shall be at least 20 deg. If a three or four wheel chassis is used, separately actuated brakes shall be fitted to the rear wheels to control the roll and assist in taxiing. If skids are used for landing, provision must be made for take-off and handling the airplane on the ground. If the design of the landing chassis permits Oleo shock absorbers are desired. If wheels are used, they shall be oversize. The chassis shall be axleless. If a tail skid is used, it shall be steerable.

The observer shall be located in the extreme nose of the nacelle with the pilot as closely behind him as the location of the rudder control will permit. Cockpits shall be arranged with all possible consideration for the comfort and convenience of the crew. The pilot's seat shall be of the parachute type and shall be adjustable on the ground. The observer's seat shall be arranged for the lap type parachute and shall fold out of the way when not in use. Controls shall be provided as spare parts for installation in the front cockpit when desired for training. The layout shall be made to accommodate these but they shall be completely removable.

Power Plant

The choice of engines is limited to the following types: Curtiss D12, Packard 1500, Curtiss V1400. Furthermore the engine installation shall be so laid out that either of the other two engines may be substituted without major structural changes.

One Radio Set, SCR 134, or dummy parts thereof, will be furnished by the Government for installation by the Contractor. The control units shall be mounted in the observer's cockpit. The only parts which need to be accessible in flight are the control unit and the antenna reel. The control boxes may be fastened rigidly to any part of the airplane which does not undergo excessive vibration.

Wright Aero. Corp. Report to Stockholders

During the year 1924 your corporation delivered aeronautical equipment having a sales value of $2,168,863.06. Of this amount, $2,052,804.11 represented shipments of developed types of aviation engines and spare parts therefor, the remainder being for shipments of experimental types of airplanes and miscellaneous items. While most of this equipment was for military requirements, a moderate number of commercial inquiries have been received, and it is believed there will be a steady increase in our sales to other than Governmental agencies.

Profit for the year ended Dec. 31, 1924, amounted to $423,524.64, after deduction of federal taxes, and is equivalent to $1.70 per share on the outstanding capital stock of your corporation, as compared with $1.31 per share earned in the year ended Dec. 31, 1923.

Your corporation continued through the year to pay dividends at the annual rate of $1.00 per share on the outstanding capital stock.

The Company has maintained its strong financial position, having current assets of $2,372,672.59, and no current liabilities, except ordinary accounts payable, amounting to $104,767.37.

Fixed assets, after deduction of reserves for depreciation, amount to $520,925.60, a decrease of approximately $100,000 from the total appearing on the balance sheet of a year ago. Your properties have been maintained during the year in a high state of efficiency, and this condition should be reflected favorably in future operations.

On Jan. 1, 1925, unfilled orders amounted to $2,416,233.65. As your corporation has had over a year's continuous manufacturing experience on the types of product represented by these orders, it is believed that operating results during the current year should show an improvement over those of the year 1924. The last annual report referred to the merger of the Lawrance Aero Engine Corporation with your corporation, and expressed the view that the purchase of the assets and business of the Lawrance Company would be productive of considerable additional business. Your officers are pleased to report that, of the unfilled orders above mentioned, more than forty per cent represents orders for engines and spare parts of the radial air-cooled type, to which your corporation received the rights of manufacture through the merger of the Lawrance Company.

Included in the above total of forward business, are a number of orders for engines to be delivered during the current year for commercial purposes. Principal among these is a contract for engines to be used in spraying cotton fields with calcium arsenate by airplane, in place of the present method. If this innovation proves successful, there should be a considerable market for engines for this purpose. Airplanes are now being regularly used for photographic work, sky advertising, and other purposes where the airplane has a distinct advantage over any other means for accomplishing the desired results. It is hoped that in the future the proportion of your corporation's product devoted to commercial uses will steadily increase. While operated by Governmental agency, the United States Air Mail Service is in reality an exceedingly large commercial undertaking, and the record that has been established to date is one that should tend to increase public confidence in the safety of flying.

A new and interesting development during the past year has been the adaptation of two models of Wright aviation engines to marine use. Modified eight-cylinder Wright E-4 engines were used in two racing boats that finished first and second in the Gold Cup Marine Trophy Races, held at Detroit in August of last year. The Wright-Tornado, T-3, twelve-cylinder aviation engine has also been adapted for use as a marine power plant. This engine is suitable for installation in express cruisers and larger speed boats, and it is expected that a limited quantity of these engines will be sold. The smaller engine is designated the "Wright-Gold Cup," the larger one is known as the "Wright-Typhoon."

While commercial aviation has progressed somewhat during the past year, as indicated above, the industry must still look to the Government for its principal support. President Coolidge, in a recent message to Congress, indicated that the importance of aviation as an arm of national defence is thoroughly recognized, and that our aerial defences will be totally inadequate in an emergency, unless there is in existence, and prepared for rapid expansion, a strong aircraft industry. With this increasing appreciation of the needs of the situation, there has come a better understanding on the part of Governmental agencies of the problems of the aircraft manufacturer doing Government business, and it is believed that the future policy of the Government in its relations with aircraft manufacturers will be such as will allow the manufacturer a reasonable return on his investment.

On account of the rapid development in the art of aircraft and aircraft engine design, it is necessary to expend large sums each year for experimental development, testing and research. During the year 1924 the sum of $157,047.14 was expended for this purpose, and it is probable that during 1925 it will be desirable to spend an even larger amount. This will keep our products up to date, and should insure a steady volume of business.

CONSOLIDATED BALANCE SHEET
as at Dec. 31, 1924

ASSETS

Cash in banks and on hand		$ 214 5[illegible]5 41
Marketable securities at cost (present market value $1,144 477)		1,113 198 82
Accounts receivable		278 891 45
Notes receivable		2 508 00
Inventories at cost		699 791 80
Interest receivable		44 143 88
Insurance deposits and advance payments		12 4[illegible]5 51
		$2,372 672 59
Machinery and equipment, etc.	$1,017 196 98	
Less Reserve for depreciation	496,271 38	520 925 60
Advances to lessors for plant additions secured by real estate		24 500 00
Direct charges to production contracts patents, etc.		34 627 35
Trust fund investments and deposits		2,761 356 68
Account unbilled to Air Service, U. S. Army, for expenditures incurred and profit accrued under "cost-plus" contracts, etc.	$1,100 456 80	
Claims against U. S. Government in equity in Aluminum Company of America claim	80,240 10	1,180,696 90
		$6,894 779 12

LIABILITIES

Accounts payable		$ 55,668 25
Accrued salaries and wages		6 805 48
Accrued royalties		157 44
Deposits on unfilled sales contracts		6 100 00
Federal taxes withheld at source		543 55
Reserve for 1924 federal income taxes		31 912 07
		$ 104 767 37
Contingent reserves		3,292 525 34
CAPITAL		
Common stock Wright Aeronautical Corporation, outstanding 249,380 shares, no par value	$2 168,188 62	
Surplus, as annexed	1 329 297 79	3,497 486 41
		$6 894 779 12

INCOME ACCOUNT
For the year ended Dec. 31, 1924

Net sales	$2 168 863 06
Manufacturing and general expenses, including depreciation on buildings etc.	1 897 585 62
Income from operations Ratio to net sales 12.52	$ 271 277 44
Income from investments interest, etc	184 159 27
Net income before deducting federal taxes . . .	$ 455 436 71
Reserve for federal taxes	31 912 07
Net income for the year	$ 423 524 64

SURPLUS ACCOUNT

Balance Dec. 31, 1923	$1 205 488 91
Sundry adjustments	51 325 76
	$1,154 163 15
Net income for the year ended Dec. 31, 1924	423 524 64
	$1 577 687 79
Dividends paid	248 390 00
Balance, Dec. 31, 1924	$1 329 297 79

LIGHT PLANES AND GLIDERS

Edited by Edmund T. Allen

A Successful Motorglider

One of the most interesting and most successful transformations from glider to lightplane that has ever been made was carried out last year on the Banner Aero Company's "Red Bird." This machine is almost exactly like the Hannover glider "Greif" which was the Hannover Technical Institute's attempt to improve on the 1921 and 1922 "Vampyr," but which turned out to be not so good a soaring machine as the Vampyr when both were in the air at the same time. The photographs and the drawings show how beautifully streamlined the entire job is and how carefully the wing is melted into the fuselage to avoid local eddies or other disturbances to the smoothest flow of air at this

One-half front view of the Rotor Vogel

juncture. The parasite drag of the Greif was certainly lower than that of the Vampyr, but its *induced drag* was higher, and so much of a detriment was the increase in induced drag that the decrease in parasite did not compensate for it and consequently the old Vampyr quite out-performed the Greif. Induced drag can be measured as directly proportional to weight squared divided by span squared for any monoplane. (It is slightly less for a biplane.) The Greif had less span and slightly greater weight than the Vampyr.

The conversion of the Greif type glider into a light plane was readily accomplished. A 21 cu. in. Douglas engine, weighing 72 lb. was mounted at the center of gravity immediately behind the pilot's seat. The chain-driven propeller shaft crosses above the pilot's head to the propeller with a front bearing supported by light streamlined struts from the nose of the fuselage. The propeller in this position has very little fuselage interference. Considering the size of this engine, the speed and climb of the machine was remarkable. The ship is reported to weigh 518 lb. fully loaded, 397 lb. empty (apparently with a very light pilot and little fuel). The minimum power required to maintain horizontal flight is reported to be 3.9 hp. The maximum speed is 68.4 mi./hr.

The induced drag of the machine as a light plane is slightly greater than it was as a glider because of the increased weight but this factor becomes less important in light planes than in gliders by reason of the increase in speed. It is easy to see why many of the German light planes have such great spans when designers realize that the induced drag may amount to as much as half the total drag for ordinary speeds, and when it can be reduced by so simple an expedient as increasing the span.

Balloon Men Hold Dinner

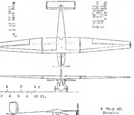
A group of fifty-two lighter-than-air enthusiasts met at a dinner given at the D.K.E. Club in New York on March 21. The toastmaster was Col. Charles de F. Chandler, former chief of the Balloon and Airship Section of the Army Air Service. The gathering was composed of those interested in lighter-than-air activities all over the Eastern part of the country, one man coming all the way from Omaha. Among those present were Cols. Chalmers G. Hall, Ira F. Fravel, and James Prentice and Maj. William N. Hensley and Major Fleischman. After the dinner moving pictures were shown of activities of Balloon Section in the A.E.F. and of the Naval airships Shenandoah and Los Angeles. A committee was appointed to arrange for a similar dinner next year and consider the advisability of a regular national organization.

Cabin Plane Demand

The Turgeon Aircraft Service of Lewiston, Me., have been engaged since 1920 in operating small airplanes throughout the Maine woods and mountains. They now feel that they are able to expand and are looking about for a large cabin plane for use in providing more complete service to their customers. If the plane proves satisfactory in service, more will be purchased later if they can find a manufacturer to supply them. The plan is to use it in a regular service from Bangor to Boston.

9 Hr. 17 Min. Gliding Record

Sergeant Wernert, a pupil of Lieutenant Thoret, has beaten the world's record flight in an ordinary airplane with engine stopped, previously held by Thoret with nine hours and four minutes duration.



Scale drawings of the Rotor Vogel

On March 10 Wernert, gliding on his machine above Alpilles, near Marseilles, remained in the air nine hours and seventeen minutes.

AIRPORTS AND AIRWAYS

New Orleans, La.

By Theodore Ray Lopez

[illegible] a flying field in New Orleans such as [illegible] airport and the [illegible] in obtaining such a field [illegible] of Commerce, by [illegible] while Foundation [illegible] authorized [illegible] in New Orleans [illegible]

Airplanes are flying over New Orleans every day. Gen[illegible] because there is no place [illegible] land, we [illegible] to a city [illegible] several landing field [illegible]

A new flying field was opened in New Orleans recently [illegible] Moisant [illegible] and Milton Gatton, for[illegible] Gates Flying Circus. The new field [illegible] which Adjutant Gen[illegible] has put in shape for [illegible]

[illegible] aerial photography [illegible] passenger carrying and [illegible] veteran pilots will fly [illegible] walking and other aero[illegible] in New Orleans, will al[illegible] course of instruction [illegible] charged for more than [illegible] permitted to take up a [illegible]

• • • •

The Gates Flying Circus have added a new ship to their [illegible] equipped with Liberty [illegible] been arranged to accomo[illegible] organization have done an [illegible] and around New Orleans [illegible] ago. Besides stunt fly[illegible] passengers, done aerial photography and other work.

The organization also conducts an air school. Several students have been enrolled and are being instructed by "Sky[illegible] has established a fine record in these parts. Of the many passengers they have carried [illegible] The circus uses the football field at Audubon Park for its base and field.

Williams "Dizzy Mac" McClymont, former staff photographer on The Item, has joined the Brooks flying circus as aerial photographer. McClymont is one of the best known photographer's in the city.

An ordinance against stunt flying over the city was introduced by Commissioner of Public Safety Stanley Ray at a recent meeting of the Commission Council. The ordinance also states that fliers should not pass over the city at an altitude lower than 1500 ft. Stunting though, may be done over the parks of the city and outlying sections.

• • • •

Airplanes played a prominent part in the recent elections in New Orleans. A Standard ship flew about the city each day carrying the name of one of the candidates, who was victorious.

• • • •

The New Orleans Model Aero Club, one of the livest organizations of its kind in New Orleans, held its annual election of officers recently with the following results. Ted Lanza, president; Tullio Emerson, vice president; Lucas Samovich, secretary; and William Castillon, treasurer.

Following the election a spring and summer program [illegible] The club maintains well equipped [illegible] and has a membership of 61 aviation enthusiasts.

• • • •

Tests to determine the density of hay fever pollen in the air over New Orleans and vicinity were made by Dr. William Scheppegrell, president of the American Hay Fever Association, during an airplane flight in one of the planes of the Gates Flying circus, loaned for the experiments by Ivan Gates, manager, and piloted by Clyde Pangborn. Beginning with 10,000 ft. the air was sampled at every level [illegible] data on the height to which the pest will [illegible] was found.

Nashville, Tenn.

The Tennessee State Legislature has passed enabling acts authorizing the City of Nashville and Davidson County to levy a ½ mil [illegible], mill tax respectively, in order to purchase and own jointly a new aviation field at Nashville. The total amount which will be realized from this tax will aggregate close to $110,000 which sum is to be used to purchase a new field within five miles of the post office and equip it with an administration building, a photo hut, a radio hut and all necessary improvements needed on a modern aedrome. Efforts to secure such legislation as that which has just passed were under way for over two years. The National Guard airmen hope to be able to extend a cordial invitation to the personnel of all Air Service stations to be present at the dedication of the new field on Labor Day. Tentative plans are under way now for such an event, but it will have to be governed to some extent by the work of the contractors.

Flying Activities in Southern California

A 5 passenger airplane for long distance service, to be added to its fleet of three and four passenger ships, is being built by the L. M. Buck Co., at Clover Field, Santa Monica, Calif. This firm is also constructing a light sport plane powered with a 7 hp. engine the speed of which is placed at 55 mi./hr. weight, empty 225 lb., loaded 392 lb.

A civilian flying school and a passenger carrying service is maintained at Clover Field by Robert M. Lloyd, 1st Lieut., A.S.O.R.C., who states that interest in flying is undoubtedly on the upward trend judging by the number of students in his school and the increase in the passenger carrying business.

Another civilian flying school is maintained by Kenneth Montee, of the K. W. Montee Aircraft Co., which concern is building several airplanes for experimental and passenger carrying purposes.

Air Travel a Legal Hazard ?

Can an arrested person be compelled to submit to transportation by airplane to the city in which he is alleged to have committed a felony or crime? This question is exciting lively discussion in legal circles since the arrest in Cassel, Germany by the Berlin criminal police of Geheimrat Hellwig, who was wanted in connection with the scandals connected with the Prussian State bank. An airplane was despatched from Berlin to Cassel and he was taken back to the capital by the air route. This is first time in European police history that a prisoner was thus transported.

Opinion is decidedly divided. It all depends upon how safe the air route is regarded. There is no provision in the German law by which an arrested person can be compelled to expose himself to danger. Those who hold transportation by airplane illegal insist that it has not yet attained the degree of safety of the steam railway or the automobile. Defenders of the air route deny the alleged lack of safety and insist that in the interests of speedy justice the air route is decidedly to be preferred.

Army Airways System

A resume of the operations of the airways system of the Army Air Service from its beginning in the Fall of 1922 to March 1, 1925, shows the following:

Number of flights completed	480
Miles flown	692,700
Passengers carried	688
Express carried in pounds	56,280
[illegible]	15
[illegible]	None
Injuries	1

The model airways system is being conducted by the Army Air Service as an incidental function in its training and [illegible]. On airway flights data is collected on meteorology, landing fields, efficiency and stability of airplanes, and engine efficiency. Valuable experimental work with instruments for aerial navigation is also conducted. The Signal Corps of the Army cooperates with the Air Service by furnishing weather reports.

Moline, Ill.

Several new students are enrolled at the Campbell Airplane Co. school and are progressing rapidly, and every indication points to a banner year for commercial aviation in general around the Tri-Cities.

Harold Vogel who is one of the newest additions to the local pilot owners club has completely recovered and refinished his JN and is now ready to answer the call of the air. Lloyd Keiner has replaced the Renault in his Standard with a C6 and certainly has improved its performance.

Rev. J. B. Culinanna is one of the few actual sky pilots and is rapidly mastering his Standard.

Dr. C. C. Sloan has been a regular attendant at the field this winter during his spare moments and has made several flights in his Laird in spite of the rather frigid weather.

E. D. Sheppers has also made several flights during the winter and says he derives as much pleasure as during the summer, the view of the snow covered landscape more than offsetting the physical discomforts.

When business and professional men such as these, who fly [illegible] for pleasure cannot be kept on the ground during the winter months, who can possibly ridicule the future of commercial aviation.

L. K. Campbell made a business trip to Wichita to inspect the new Travel Air three place ship.

A filling station for autos, two new hangars and an office are among the improvements to be added at the field this spring. The Campbell Airplane Co., invites all pilots to take advantage of the field's facilities when near the Tri-Cities. The field is of ample size to accommodate any type plane, is free of surrounding hazards and is located two miles south of Moline adjoining a paved road on the east with the line of hangars on the north side.

Boston, Mass.

Lieut. Jasper K. McDuffie, commanding officer of the Eighth Photo Section of Mitchel Field, with Sergeant William McQuillian as photographer, flew from New York via New Britain, Conn., to Northampton March 4 where they photographed the United States Veterans' Bureau Hospital number 93 for Bureau officials coming to Boston to land. There is discussion whether the Government shall enlarge the Northampton Hospital or build one near Boston, and the aerial photographs are to play a part in the decision. Lieutenant McDuffie also delivered two packages of Air Service lantern slides for Capt. L. R. Knight, Corps Area Air Officer. The flying time up was two hours and five minutes. Before returning after lunch photographs were taken of the Boston Airport to show present ground conditions.

• • • •

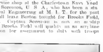
Later, the same day a twilight landing was made by Lieut. "Merritt" Merrill, piloting a Curtiss Oriole, for the Curtiss Exhibition Company with Arthur M. Galaid of Boston as passenger, the plane having flown from Bolling Field near Washington with inaugural pictures for local papers in 4 hr. 35 min. A special detail under Staff Sergt. George E. Schmidt, U.S.A., had marked the runways with gasoline flares and Very pistol flares were also used to enable the pilot to spot the field in the dusk. Although a stranger to the Boston field, a perfect landing was made at 5.50 P.M. Lieutenant Merrill returned to Hazelhurst Field, L. I., the next day.

On the seventh the second Washington plane, a United States Mail DH, piloted by Wesley L. Smith with Mrs. Mabel W. Willebrandt, assistant United States attorney general, as passenger, landed here at 5.45 p.m. They left Bolling Field at 11 a.m., making a stop at Hadley Field, N. J., to service the plane. Flying time from Washington was five and one-half hours.

• • • •

The seaplanes at the Naval Air station at Squantum, which has been quiet so far this spring, are being put in condition to begin the water flying soon. The Navy JN at the Airport is to be taken out of commission for a month and have a new body fabric and its engine overhauled, at the Navy plane service shop at the Charlestown Navy Yard.

Capt. Edgar P. Sorenson, U. S. A., who has been a student in Aeronautical Engineering at M. I. T. for the past eighteen months will leave Boston tonight for Brooks Field, San Antonio, Tex. Captain Sorenson is now an airship pilot and while at Brooks Field will qualify as an airplane pilot in preparation for assignment to duty with troops on foreign service.



George Bischof and his flying signboard which [illegible] his sales

Aerial Advertising

George Bischof of Fort Worth, Tex., is, in addition to his aerial activities, a salesman for Stromberg carburetors. In order to increase his sales, he has painted display advertising on the sides of a Jenny. This form of advertising has so appealed to the Stromberg Company, that they have issued Bulletin No. 2176 to their agents all over the country showing a picture of Mr. Bischof and his plane and pointing out what a valuable advertising medium the airplane is.

San Diego-Los Angeles Airline

The Ryan Flying Company of San Diego started a daily service between San Diego and Los Angeles on March 1. The Ryan-Standard four passenger cabin plane is being used for the present. This plane was described in AVIATION for September 29, 1924. The line is known as "The San Diego-Los Angeles Air Line." The managing directors of the line are T. C. Ryan of San Diego and B. F. Mahoney of Los Angeles.

The opening of the line was made quite an event in both terminal cities. The three planes of the airline flew in formation from Los Angeles to San Diego carrying twelve moving picture people and escorted by Army and Navy planes. The San Diego Chamber of Commerce officially welcomed the arrival of the first regular passengers by air. A luncheon was given by the same organization in honor of the occasion. The three planes with their passengers took off on their return trip at 4.00 p.m.

Polish Air Routes

A Polish commission recently appointed is making the necessary arrangements for an air line from Lodz to Danzig, via Warsaw. This is to connect with the other parts of Poland's airway system, and is to be ready for operation during the present spring.

UNITED STATES AIR FORCES

U. S. ARMY AIR SERVICE

Beoedict Crowell e Brigadier General

The Secretary of War has recommended to the President, the appointment of Benedict Crowell, as Brigadier General in the Ordnance Officers Reserve Corps. Mr Crowell served as Assistant Secretary of War during the World War. He has always been interested in aviation and was one of the Aero Club of America's most active presidents. Mr Crowell has been one of those most interested in the development of Ordnance, and is now president of the Army Ordnance Association. In the opinion of the Secretary of War, his technical knowledge and business experience would be of material use to the country in case of another national emergency.

Reserve Officers in Flight

The 91st Division Air Service participated in what is believed to be the largest cross-country flight on record of Air Service Reserve officers, inactive status. The personnel of the flight consisted of the Executive Officer of the 91st Division, assigned from the Regular Army, 24 Reserve officers and 3 enlisted mechanics.

The 316th Squadron, of which most of the above Reserve officer personnel are members, left Crissy Field, Presidio of San Francisco, Calif., on Feb. 20, for Mather Field, Sacramento, Calif., in three flights. Headquarters Flight, comprising three DeHavilands and one JN6H, was made up of the Executive Officer, 91st Division, personnel of Division Headquarters, and several Reserve officers attached to the Division for training. "A" Flight, under its flight commander, Captain Eaton, consisted of five JN6H planes, and "B" Flight, under its flight commander, Captain Potter, consisted of five JNS planes.

Weather conditions were very unfavorable. In fact, rain was falling at the time the squadron left Crissy Field, and there was a ceiling of approximately 500 ft. for the entire trip across San Francisco and San Pablo Bay. From Benicia on to Sacramento the height of the ceiling varied, at times being as high as 1500 ft. However, in spite of clouds and intermittent rain, the entire flight arrived at Mather Field on schedule and in the record time (for JN's) of 55 min.

The return flight was made the following day, with a minimum ceiling of about 400 ft. in the middle of Sacramento Valley. There was, fortunately, plenty of altitude when crossing San Francisco Bay, and no difficulty was experienced by any of the planes.

Altogether, the trip was conceded to be the best the 91st Division has made since its organization.

340th Observation Group Organized

The 340th Observation Group (Reserve) was organized recently at Crissy Field, Presidio of San Francisco, Calif. Maj. J. S. Marriott, formerly C.O. of the 372d Squadron, was put in command of the 376th Squadron of this Group. Capt. R. W. Kearney, formerly Operations Officer of the 372d Squadron will command the 388th Squadron of the Group and Capt. Burdette A. Palmer, formerly with the 91st Division, the 381st Service Squadron, leaving only the Photo Section open for assignment.

Headquarters of the Group was temporarily organized with the exception of the Group Commander. Capts. J. W. Tubergen and R. T. MacDonald have been assigned as Operations Officer and Group Adjutant, respectively. The assignment of Group Commander is being held in abeyance awaiting action of a Board regarding the rating as Junior Airplane Pilot of a very desirable Lieutenant Colonel of the Air Service Reserve.

Personnel sufficient to fill in the Headquarters Sections of the three squadrons concerned are available and have been assigned, with a slight surplus to begin the organization of the flight in the two observation squadrons. Complete organization should be effected prior to calling the Group to active service during the coming summer.

Army Air Orders

Sec. Lieut. Hugh Crosser Minter, A.S., promoted to grade first lieutenant.

Maj. Harrison H. C. Richards, A.S., Washington, D. C., to Langley Field.

Following officers A.S. from Brooks Field to Kelly Field, for instruction: Sec. Lts. Robert I. Brookings, John H. Clembrook, jr., Howard H. Couch, William O. Eareckson, Henry G. Fisher, Alexander G. Greig, Kirtley J. Gregg, John R. Hawkins, Washington M. Ives, jr., Ralph H. Lawter, Frank R. Loyd, Denis J. Mulligan, John O. Murtaugh, Kenneth C. Strother, Howard M. Turner, Leo D. Vichules, Lyman O. Williams, Capt. James L. Hatcher.

Capt. Henry C. White, A.S., relieved from observation and treatment, Army & Navy Gen. Hos., Hot Springs, and will report station Little Rock.

Sec. Lt. Noah Mathew Brinson, A.S., Brooks Field, transferred to Infantry, Fort Sam Houston.

Sec. Lt. Robin Bernard Pape, A.S., Brooks Field, transferred to Coast Artillery Corps and will proceed to San Francisco, sailing on transport May 14 for Hawaii.

Following officers A. S., Kelly Field, to stations indicated: Capt. Ross G. Hoyt, Washington, Sec. Lts. Robert W. Douglas, jr., Selfridge Field, Charles D. McAllister, George F. Schulgen, Selfridge Field, John K. Nissley, Elmer T. Rundquist, Archibald Y. Smith, Langley Field, Don W. Mayhue, Pope Field, Otto P. Weyland, Fort Sam Houston.

Capt. Harry Ellwood Radcliffe and First Lieut. Lester Draper Seymour, Washington, to McCook Field.

Majs. William N. Hensley, jr., and John D. Reardon placed on detached officers' list, upon their arrival at Washington Barracks, D. C.

Following officers A.S. relieved from duty Brooks Field and will report Kelly Field: First Lieut. Don. L. Hutchins, Sec. Lieuts. Edward F. Booth (Inf.), Cornelius W. Cousland, Eugene B. Ely, Ralph E. Fisher, George A. Ford, Albert F. Glenn, Rupert D. Graves, Richard G. Herbine, John P. Kirkendall, Clyde Massey, Harry W. Miller, George J. Smith, Edward H. White, Walter C. White (Inf.), Gordon T. Waite, John J. Williams.

Sec. Lieut. Fred A. Ingalls, A.S., Brooks Field, to San Antonio Ind. Dep.

Capt. Hubert Reilly Harmon, A.S., promoted to the grade of major.

U. S. NAVAL AVIATION

Commendation for Naval Air Heroes

The Secretary of the Navy has commended six enlisted men of the Navy for their actions at the time of the crash of Seaplane F5L, No. 3575, at the Naval Air Station, Naval Operating Base, Hampton Roads, Va., on Dec. 23, 1924.

William Edward Mayo, aviation machinist's mate, 1st class, who was a member of the wrecked plane, as soon as possible cut off the gas and climbed up and pulled the wires leading to the distributor head off the starboard motor, stopping the propeller that had already killed three men. He then aided in holding up the bodies of the injured men until help arrived. Mayo reenlisted on Aug. 15, 1922.

Four men who were standing on the runway at the time of the crash jumped into the cold water and swam to the crippled plane. Upon reaching the plane, they rendered great assistance in rescuing the bodies of those who had been killed. These men were: Marshall H. Allen, aviation machinist's mate, 1st class, U.S.N., who reenlisted Nov. 1, 1922. Ernest Clark, machinist's mate, 2nd class, U.S.N., who enlisted, Nov. [illegible], 1922. Bartholomew G. Wangowski, seaman, 1st class, U.S.N., enlisted Aug. 15, 1922. Gregory Vernon Miano, chief machinist's mate, who reenlisted on Oct. 24, 1923.

James Henry Swafford, seaman, 2nd class, U.S.N., who is a member of the crew of the boat sent out to the assistance of the crippled plane's crew. He jumped overboard and lent great assistance in rescuing the bodies of the plane's crew that had been killed in the crash. Swafford enlisted on Nov. 7, 1923.

Saratoga Launched Soon

The United States airplane carrier Saratoga will be launched at the plant of the New York Shipbuilding Corp., Camden, N. J., on April 7. Mrs. Curtis D. Wilbur, wife of the Secretary of the Navy will be sponsor, and high government officials will be invited to witness the ceremonies.

The Saratoga is 850 ft. long between perpendiculars and 888 ft. long overall. The maximum beam at the flying deck is 105 ft. Tonnage 35,000. Draft 30 ft. She is equipped with engines with 180,000 hp., built by the General Electric Co., at Schenectady, N. Y., which will give her a speed of between 33 and 34 knots. Her main battery will consist of eight 8-in. guns in four turrets.

The Saratoga will carry 72 planes, half of which will be of heavy duty type, and which will include fighting, bombing, torpedo, scouting and observation planes. These planes will be operated from the flying deck of the vessel which will afford them ample space in which to take the air and upon which to alight at the completion of flights. Arrangements for the safe and rapid handling, launching and receiving of aircraft on board the vessel will be provided, also ample facilities for the repair and upkeep of the aircraft carried. The flying deck which will extend over the entire top of the vessel from stem to stern will be free from all obstruction with the exception of an "island" on the starboard side, where the masts, uptakes, turrets, and superstructure will be located.

This vessel was authorized by the Act of 1916 which provided for a three year building program. Originally it was one of the six battle cruisers, included in that program. The original contract was let just before the entrance of the United States into the World War, and work was delayed in order to facilitate the building of smaller type of vessels. After the war, the vessel as a battle cruiser was re-designed to give it the benefit of the experience of the war, and the keel was not laid until Sept. 25, 1920. The part of the vessel below the water line was retained as far as practicable the same for the airplane carrier as for the battle cruiser, and the vessel was designed to have improved protection against underwater attack.

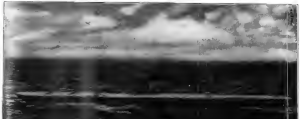
At the time of the Conference for the Limitation of Armament, the vessel was about one-third completed, and while four of the six battle cruisers were required to be scrapped by the terms of the Washington Treaty, the Saratoga and her sister ship, Lexington, were retained and permission was granted to the United States to convert them into airplane carriers.

Tentative plans of the Navy Department contemplate the construction of three more airplane carriers after the completion and commissioning of the Lexington and Saratoga.

Under the Five Power Naval Treaty negotiated at the Washington Arms Conference the total tonnage for aircraft carriers for the United States was limited to 135,000 tons, for the British Empire to 135,000 tons, for Japan to 81,000 tons, for France to 60,000 tons and for Italy to 60,000 tons. The treaty stipulates that no aircraft carrier exceeding 27,000 tons shall be acquired or constructed by, for or within the jurisdiction of any of the contracting powers. However, any of these powers, provided its total tonnage allowance of carriers is not exceeded, may build not more than two carriers each of 33,000 tons.

The Saratoga and Lexington each will have a displacement of 33,000 tons, or an aggregate of 66,000 tons, leaving a balance of 69,000 tons for other carriers that can be built by this country under the 135,000 treaty limitation. The tentative decision of Secretary Wilbur and his advisers is that this surplus of 69,000 tons should be used for three more carriers of 23,000 tons each.

Congress has not yet authorized an appropriation for them and probably the Administration will not seek it until the winter of 1926-27. The Saratoga and Lexington are slated for completion in October, 1926. They will be immediately commissioned, stocked with planes and put through tests to see whether changes in design should be drawn for the other three. The Saratoga and Lexington, when completed and stocked with planes, will cost $90,000,000.



Wash drawing of the Saratoga as she will appear when completed

PUBLISHER'S NEWS LETTER

Occasionally publicity has the effect of being an embarassment of riches. It also, sometimes, takes a turn that is entirely unexpected. Example: "The Ford Air Pullman." For several years the genial "Bill" Stout has been at work developing a metal monoplane in Detroit. Several hundred men, some of them of great prominence, have bought stock in the company, but none of them, it is said, has invested any large sum or holds enough stock to control the policy of the concern. The work has been largely in the nature of an engineering enterprise, with the building of metal aircraft as the objective. Until recently no publicity was desired. In fact, the company boasted of the only press agent in captivity whose chief aim in life was to "keep news out of the papers." With the sale of one of the Stout monoplanes to the Air Mail, and the removal of the factory to the new Ford Airport, the ban on the much avoided publicity was lifted. But it was not expected that the opening of the safety valve would release the pent up news in the direction that it has. Perhaps the press agent overplayed the role he was cast for, and those irrepressible newspaper writers—such as Arthur Brisbane—just had to tell the world the grand and glorious news that, soon, everyone who had a $5,000 bill to spare could go to the nearest Ford dealer and fly away with the newest product of the automobile Croesus.

* * * *

But to get back to the almost forgotten designer, whose name even seems to have been outside the vocabulary of the newspapermen who have been so prying,—perhaps the press agent did succeed in this one particular. But it is more to our liking to believe that it was due to his acquired modesty while the editor of an aeronautical paper. Perhaps it will be news to some of our readers that three of the best known aeronautical constructors in this country started their careers in the humble role of editors. Stout admits that he was the "Founder and first Editor, *Aerial Age*," Chance Vought was "Technical Editor and Editor, *Aero & Hydro Aviation Weekly*." Walter Phipps, one of the most promising of the designing engineers before he had to take an enforced rest at Saranac was an editor of *Aerial Age*. Of course to these might be added the Wright Brothers who were also editors of a juvenile paper which, if they has not been so successful in their glider work, would probably have developed into another of the many aero publications. But, in the case of Stout, there is a deeper and more injurious side to the present predicament that he finds himself in.

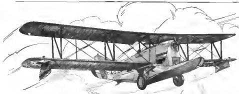
* * * *

To have the result of years of work and experience suddenly caught up in a whirlwind of sensational propaganda and to see it go out before a credulous world labeled with a name that will always stick, is the hardest kind of ill fortune. It may be a lesson, which while trying to the victim, may be of value to others. Publicity when directed in the way it should go is the greatest force in creating a reputation or good will. When it gets loose and uncontrollable, it can be just as harmful. To stamp a name on a product so that by no chance it can be forgotten or mistaken, is a form of business insurance that all prudent executives recognize. This practice applies just as much to the airplane as to any other product.

The above "inverse" publicity is only one of the many signs that this year is to be a good sales season for commercial aircraft. The number of new types of airplanes that are intended to be used for specialized purposes thet have made their appearance have been larger than has been seen since the war. Possibly the passing of practically all the surplus supplies that could be used for commercial air traffic has contributed to this fortunate condition. It almost seems that the time has arrived when new models can bear the year of their manufacture and each spring the new developments in aeronautical engineering be shown to prospective purchasers, as is done in the motor trade. That there has been too much reliance placed on government orders by the constructors of aircraft and not enough attention paid to the commercial needs, is understandable when the size of the orders given is remembered. The revival of interest in commercial aviation seems to have a good chance of making headway this year.

* * * *

Last year AVIATION proposed that the aircraft industry use names for their machines and the suggestion hes been adopted. The names of the new Wright engines and the new Curtiss airplanes resulted directly from this suggestion. Now, instead of letters and numbers, the names of aircraft products can be identified and advertised with some hope that they will be remembered. If the Stout metal monoplane had been so firmly fixed in the mind of the public that no one, even one of the best informed writers in the world, could mistake its purpose or parentage, the irreparable impression that has been made would heve been avoided. As is well known in the newspaper offices, "the denial never ketches up."—L.D.G.



A New Bird—
The Loening Amphibian

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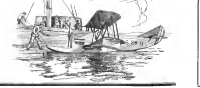
The photograph above shows the new Loening Amphibian emerging from its hangar. This entirely new type of American metal airplane has for the past year been undergoing secret development at the Loening plant in New York City



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